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संस्कृत-संशोधन-संसत्-पत्रिका

TATTVADĪPAḤ

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Sir,

Sub: Sending the Journal Tattvadipah - 2000.

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With reference to the above, we wish to inform you that we have brought out our half yearly Journal Tattvadipah 2000. Since you are the contributor of the article for this Journal we are sending by Regd book packet one copy of journal and 10 copies of off prints of your article. Kindly acknowledged the receipt of the same and extend your kind co.operation in bringing out the further issues of our Journal.

Yours faithfully,

M.D. Rangarajan
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A note from the publishers...

We are glad to place in the hands of the seekers of knowledge Tattvadipah - Vol. IV Nos. 1 & 2 (January-December 2000) containing articles by erudite scholars. We hope that the readers find these articles interesting.

The Academy continues to put forth its sincere efforts to clear the backlogs. We invite scholarly articles for the future issues well in advance to speed up the publication.

Our thanks are due to Dr. H.V. Nagaraja Rao, Executive Editor for editing this issue.

We solicit views from our readers to improve the quality of the journal. Also we seek the suggestions of the readers in making the journal more informative, attractive and useful.

December 2000

Publishers.

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Editorial

Vid. H.V. Nagaraja Rao

Man's search for truth is eternal. The search should and will continue for ever. The paths towards the goal may be different, but the aim remains the same. Scientists, philosophers and devotees struggle in their own distinct ways to reach the truth. Whether one has reached the summit or not is not that important. The climb is worth the effort. This is true not only in expeditions to conquer mountains, but also in all worthy endeavours. The experiences gained while solving any problem, even though the solution may not be final, enrich mankind. This is especially true in the philosophical arena, where the cumulative results of earlier thinkers enable the future generations to watch vast scenarios with comparatively easy striving. This has been beautifully said by Abhinavagupta, a great thinker of Kashmir in his Abhinavabhāratī:

ऊर्ध्वोर्ध्वमारुह्य यदर्थतत्त्वं धीः पश्यति श्रान्तिमवेदयन्ती ।

फलं तदाद्यैः परिकल्पितानां विवेकसोपानपरम्पराणाम् ॥

"That our intellect is able to visualise the Reality without any strain is possible because of the stairs created by the earlier thinkers. This should not be forgotten by achievers in any field."

Viśiṣṭādvaita Philosophy, as we have it, is the divine fruit of the efforts of some of the greatest men this land has ever produced. As Śrī Vedānta-deśika states:

नाथोपज्ञं प्रवृत्तं बहुभिरुपचितं यामुनेयप्रबन्धैः

त्रातं सम्यग्यतीन्द्रैरिदमखिलतमः कर्शनं दर्शनं नः ॥

The Triumvirate Śrī Nāthamuni, Śrī Yāmunācārya and Śrī Rāmānujācārya built up this exquisite edifice in the realm of theistic philosophy. That was further decorated by great scholars like Sudarśanasūri, Ātreya Rāmānuja, Maṇavāla Māmuni, Vedāntadeśika etc. with their wonderful works.

Contribution of Vedāntadeśika needs special mention because he was not only an extraordinary scholar, but a poet of highest calibre, a devotee of deep fervour and a logician of the loftiest level. Very rarely indeed one comes across a personality in the history of mankind, where all the great qualities, merits and excellences combine sage Nārada's words at the beginning of the Rāmāyaṇa viz.,

बहवो दुर्लभाश्चैव ये त्वया कीर्तिता गुणाः ।
मुने वक्ष्याम्यहं बुद्धा तैर्युक्तः श्रूयतां नरः ॥

Come to the mind when one thinks about Śrī Vedāntadeśika.

In the present issue of Tattvadīpa we are offering the readers an article entitled "Aucitya in the poetry of Vedāntadeśika". Aucitya is a comprehensive concept in Indian Poetics. All the stalwarts of Alaṅkāraśāstra have dealt with this concept and recognised its importance. Ānandavardhana, the prince among Ālaṅkārikas, says that absence of Aucitya is the greatest blemish of poetry and maintenance of Aucitya (propriety) is the secret of success in delineating the Rasa. Kṣemenda, a prolific writer of Kashmir, has written a treatise called "Aucityavicāracarcā" to enunciate the principle of propriety in its entirely. Śrī R.V. Seshadri is the contributor of this article. It is remarkable that the contributor, an advocate by profession, has exhibited such a mastery of poetic criticism. His sensibility is appreciable.

Next we have an article on "Rāvaṇa's Laṅkā". It is really difficult to identify the island of Laṅkā described in Vālmīki's Rāmāyaṇa. The author Dr. Laxmi Sharma has tried to show that the present Śrīlaṅkā was not Rāvaṇas Laṅkā, because the geographical data given by Vālmīki do not tally.

Pandit Ojha's research in this regard has been critically viewed in this article. We hope this article will shed some light on the topic and benefit the readers.

Next there is an article by the editor which shows some glimses of Karuru Śrīnivāsācārya's commentary on Vedāntadeśika's Varadarājapañcāśat. There is a long and illustrious tradition of Śrīvaiṣṇava commentators who have rendered yeoman service to the cause of dissemination of the divine knowledge hidden in various texts. But for their commentarial exposition, it would be impossible

for common readers to understand the nuances of poetry and secrets of the siddhānta. It is hoped that the article will induce the readers to study the said commentary in depth.

The next article "Measurement of worlds in the Vedas" is by Sri Arun Kumar Upadhyaya. The author's views may be controversial, but deserve the attention of readers. Indian's achievements in mathematics and astronomy were far ahead of those of other countries in ancient times. As suggested by the author, we should try to retrieve what is lost or forgotten.

Then we have a valuable contribution by the venerated and renowned scholar Panditaratnam K.S. Varadacharya. The article is in Sanskrit and discusses the subtle points of the different schools of Vedānta. It is well known that there are Vedic statements supporting difference (bhedaśṛtis) in the Vedas and there are other statements in the same Vedas which uphold non-difference (abhedaśṛtis).

Śrī Rāmānuja reconciles the apparently contradictory Vedic statements by introducing the concept of Śarīrasārīribhāva. It is not easy to comprehend this concept. Only scholars like Sri K.S. Varadacharya, who have studied all branches of Vedānta with an open mind can explicate such concepts. This is an article which needs not only to be read, but studied meticularly. The learned author takes up the question of the nomenclature of Rāmānuja's school. Viśiṣṭādvaita or Saviśeṣādvaita. He concludes that Saviśeṣādvaita is the main purport of all śrutis. We hope this article will attract the attention of the great scholars of all schools of Indian Philosophy.

We have another article by a budding scholar Dr. Dilip Kumarkar, on the nature of Adhyāsa. Śaṅkara gives five definitions of Adhyāsa in the Śārīraka-bhāṣya. The article discusses them in depth.

We have accommodated some Kannada material too in this issue. The article "Kāla" by M.K. Shingraiyengar deals with the concept of time in the light of ancient treatises and modern inventions.

The next article is descriptive in nature and gives a vivid picture of the beginning scene of the Rāmāyaṇa. The article titled "śāstra" is informative and tells about the eighteen śāstras traditionally accepted.

On the whole, a good fare has been offered for thought to the readers in this issue. Needless to say, we invite constructive suggestions by our esteemed readers for the improvement of the journal. We also crave the indulgence of learned scholars and earnestly request them for valuable research articles.

It is my pleasant duty to record my deep gratitude to professor M.A. Lakshmitatacharya, Director of the Academy of Sanskrit Research, for his incessant encouragement and unfailing help in the publication of this journal. Sri M.A. Narasimhan, who is affectionately called "Thambi" by one and all, deserves thanks for his untiring work for this publication. I should not forget the valued assistance rendered by each and every member of staff of the Academy of Sanskrit Research. May Lord Sampath Kumara, the presiding deity of Melukote, bless them.

Measurement of worlds in the Veda

Arun Kumar Upadhyay

I. Background and Purpos e – The year 2000 A.D.an article by me had been published which gave Vedic view of world starting from atom to the end of visible universe. It gave size and relation between various structures and described the physical meaning of ten dimensions of world described in Vedas. This was named 'Dimension numbers in vedic thought' and that discussion led to the link between various branches of philosophy. Another article of similar nature was published – "Three sevens – foundation of Vedic Science". This is based on the first verse(1) of original veda *'Atharva'*– Worlds are covered by three sevens.(2) Under 250 years of British education designed by Maxmuller etc. to uproot the vedic culture, we are accustomed to think that vedas are of recent origin and are song of illiterate cowherds. So all thing of knowledge are suspected to be based on modern science having no relation to vedas. First step of destroying vedic knowledge is to create a reverse theory that *Atharva veda* was last among vedas.[3] Second is to declare that 'veda' doesnot mean knowledge but song of illiterate persons[4]. The method of ignoring Indian texts, thoughts and scholars and quoting only among themselves as sign of modern research is aptly described in Muṇḍakopaniṣad.[5] Under this situation it is necessary to trace the original source of such conclusions. It will give a new light to vedic studies.

2. Sources of Vedic definitions – Vedas were told to persons who were familiar with qualitative and quantitative concepts of various structures of universe from atom to galaxy and more. Twice this knowledge has been lost- once by Asuras, *Hiraṇyākṣa* took it away. Then it was lost due to great floods. Vedic text of 13,000 B.C. was preserved but after the great floods of 9000 B.C. auxiliary texts were lost. To understand the vedas, 6 limbs were created as mentioned in *Muṇḍaka upaniṣad* (1). After that, vedic meanings in yajna model were explained by *Brāhmaṇa* texts including *āraṇyaka and upaniṣads.*

Till *Mahābhārata* era (before Kali in 3102 B.C.) technical texts of many sciences existed as seen in the use of many divyāstra, having effects like the modern nuclear devices. For non-technical persons *Itihāsa* and *Purāṇa* were told to explain vedic concepts through maps, models, idols etc., Even technical texts use these form conceptual knowledge. After destruction of civilisation in *Mahābhārata* era, this remains as the only source of vedic explanation.[6]

Some theoretical texts which survived Mahābhārata war were not understood in absence of laboratory and technical education and were destroyed by Buddhists (Buddha was in 1886-1807 B.C.as per Purāṇa, confirmed by astronomy). Bhāskara I in his commentary on Āryabhaṭiya (499 A.D.) writes that it has mentioned some important formula without proof. Original texts by *Maskari* (algorithm), Purāṇa (Axiomatic theory), Pūtana (numerical analysis, calculus), and *Mudgala* (Deiscret mathematics)[7] are destroyed by Buddha to propagate his philosophy.[8]

Now our problem is that we don't have any technical text. The existing texts on astronomy, architecture, medicine and surgery etc, are only a means to remember the technical terms and important formula through sanskrit verse. Their meaning definition, method, proof, use of instruments, materials etc. are not understood as tradition of technical education was partly broken after *Mahābhārata* and Buddha and totally shattered by *Hūṇa, Śaka* attacks and later by Islamic and British rule. Most complete destruction was by British who find astronomy in broken Stonehenge structures of England but ignore the specific formula of Sūryasiddhānta of ours.

Now we have no choice but to find technical informations from literary texts. Such random information is surprising, for the present state of education where professors of literature, history, philosophy etc. are completely ignorant of the level of our science. Even in physics texts of universities, velocity of light will not be mentioned in the Mechanics section, but it will be in optics. Size of atom will be mentioned in quantum mechanics. But the astronomical dimensions will not be mentioned in any of these. Only the omissions or gaps are highlighted for Indian texts like astronomy.

3. Size of Atom – Atom is commonly translated as 'paramāṇu' however, its literal and phonetic meaning is the same as 'ātmā'. 'ātmā' is indivisible (Gītā 2/24 calls it *'acchedya'*). Atom also is 'A+tome' i.e. it can not be cut. ātmā is the centre of consciousness and an abstract thing, its concrete form of action is called *'Jīva'* whose size is given in *upaniṣad*[9] as ten thousandth part of a hair end *(vālāgra)*. Common human hair is of 4 micron (10^{-6} meter) thickness. If its end is taken as 1 micron it is 10^{-10} meter i.e. one Angstrom which is the size of atom.

Varāhamihira in his *Bṛhatsaṃhitā*[10] mentions size of *vālāgra* and *paramāṇu. paramāṇu, raja (rathreṇu of Mānasāra) vālāgra, Likṣā, Yūka, Yāva and aṅgula* are successively 8 times larger than the other. Here 'paramāṇu' means smallest unit from which measurement begins and not as an atom. Here 24 aṅgual make a hasta (hand) = 45 cm. Hence vālāgra is 45 / ($24x8^4$) = about $4x10^{-4}$ cm.i.e. 4 microns.

According to *Tiloyapannati* 1/93 – 132)

1 *paramāṇu* = 1 *aṅgula* (1.88 cm) x 8-13 = 3.5x10-12 cm.

This is of the order of nuclear diameter

In *Lalita Vistara* (a Buddhist text)

1 *paramāṇu* = 1 *aṅgula* (9 cm) x 7-10 cm. = 0.66x10-8 cm

This is equal to Bohr radius of a hydrogen atom. (11)

Atom *(Jīva)* is the smallest level of viśva, in the sense that it is a closed independent structure.[12] Event inside an atom are not influenced by any outside factor.

4. World of cell – There are two types of micro lives-one is the independent micro-organism and the other is, cell of human body (or of any animal or plant). *Carakasamhitā*[13] describes 20 types of micro lives. From outside waste-*Yūka and pipīlikā (līkṣā)* are produced. Other 18 types are from blood, kapha, waste and correspond to cells and parasites. One variety of blood creature is keśād which means of hair size *(Vālāgra)*. Thus micro - organisms are of *vālāgra* to *Yūka* size. *Vālāgra* is $4x10^{-4}$ cm as mentioned above. *Atharvaśira upaniṣad*[14] also tells that god lives in the heart which is of vālāgra size. Caraka and *Suśruta*[15] have called the start of human life in the egg form in the womb as 'Kalala'. 'Kalila' is one of the forms of *viśva*[12] where god resides.

5. World of human body – *Caraka*[16] has clearly mentioned that man is a world by himslef. *Puruṣa sūkta* also states that whatever is seen in the world is *Puruṣa* (man) including all past and future things.[17]

Cell in a Puruṣa – In *'Śatapatha Brāhmaṇa* (12/3/2/5-6) *Vārkali*[18] has compared parts of man *(Puruṣa)* with a year *(Saṃvatsara)*. Accordingly, an year has 10,800 *muhūrta* and *muhūrta* is repeatedly divided by 15 times to give *kṣipra, etarhi, idam, prāṇa, ana, nimeṣa, lomagartta, svedāyana* (8 divisions).

1 *muhūrtta* = 1 day/30 = 48 minutes

1 *svedāyana* = 48x60 seconds $15^8 = 1.12 \times 10^{-6}$ seconds.

He explains the meaning of svedāyana, that water drops of a cloud fall from that height. If this height is taken to be 270 meters, then velocity of light will be 3,00,000 kms per second. Sāyaṇa in his Ṛgveda commentary(19) has specifically stated that light travels at 2202 yojans in half a nimeṣa.

Another meaning of *svedāyana* is, that which is born of Siveat i.e. cellular organisms. Number of cells in a human body is equal to the number of *svedāyana* in a year i.e. 1.84×10^{12}. Central sphere of man is head, *Puruṣa* extends ten times(20). So, number of neurons in human brain is 10^{11}. Same should be the number of particles (Kharva = 10^{11} or particle) in other spheres of the world.

The number of Cells can be estimated in another way also. *Caraka Samhitā* tells that there are 30,956 branches of arteries(21) Same is the number of hairs in head, face and on skin. *Bhāgavata Purāṇa* describes that, each hair of(22) great Puruṣa has 10^7 brahmāṇḍas. Thus the cell world in man are 3.1 x 10^{11} or three times this value.

6 Measure of Earth.– Therea are different types of Yojanā units of length in which dimension of the earth has been given. It is like the use of a nautical mile of astronomy or the use of metre as part of the polar circumference or standard mile or kilometer for survey purposes. For scientific purposes, it is linked to velocity of light. All the three types of units have been used by the

ancients. For survey purpose, *Līlāvatī*[23] gives 1 *yojana* = 32000 hands = 16,000 yards (or meters). If we take it in terms of yards, then 1 yojana = 0 1760 miles or 100/11 miles or 9 1/11 miles. Taking the meter value, it will be slightly bigger, to be exact it will be 16 kms.

For astronomical purposes, yojana is found by dividing the earth's diameter or circumference by a round number-

Pancasiddhāntikā (1/98)- circumference = 3200 yojana

Āryabhaṭīya (1/5) and Lalla – Diameter = 1050 yojana (1 yojana = 7.9 miles)

Sūryasiddhānta (1/59) Diameter 1600 yojana

siddhānta śiromaṇi of Bhāskara II

(*Golādhyāya,* bhuvana koṣa 32) circum 4800 yojana

In these two texts, 1 yojana=miles approx. Thus the same author *Bhāskara* II has used astronomical *yojana* of 5 miles in *siddhānta śiromaṇi* and survey *yojana* of 9 1/11 miles in arithmetics text *Līlāvatī.*

Yojana of astronomy texts has been found by comparing diameter of earth from modern values. Indian Astronomical ephemeris 2001 gives the figure-

Equatorical radiius = 63, 78, 140 meters (IUGG value is 3 meters less) Polar radius is about 21 kilometers less.

Yojana is linked to time unit in two ways. Difference in sunrise time at two places is 4 minutes for each degree of longitude difference, due to 360^0 rotation of earth in 24 hours. Puṣkara has been mentioned to be[24] 1 *muhūrta* west of *Ujjain* (12^0 west) Which is Bukhara of Uzbekistan. By calculating circumference for a latitude, *yojana* can be found. Relation of *yojana* with velocity of light is by definition of the smallest time unit truṭi. This is mentioned in Sūrya Siddhānta (1/ 11) without definition. *Vāṭeśvara siddhānta* and *Siddhāntaśiromaṇi*[25] have defined truṭi as time taken by a sharp needle in piercing a lotus petal. 3000 *truṭi is nimeṣa* which is 1/18 part of *Kāṣṭhā* in astronomy but 1/15th part in puraṇas[26]. 30 Kāṣṭhā is a kalā, 30 kalā is 1 *ghaṭī*= 1 *muhūrta,* 30 *muhūrta* = 1 sidereal day (axial rotation of earth in 23 hrs 56 m 4 sec.). *If muhūrta* is defined as 30th part of solar day of 24 hours, then it is equal to 30.1 kalā *(Mahābhārata śānti parva* 231/12). This is different from *kalā* of *jyotiṣa* which is 60th part of muhūrta. Quotation

of *Sāyaṇa* about velocity of light [19] uses this *nimeṣa* (=16/75 x 300/301 sec). Definition of *truṭi* is not definite as time in piercing lotus petal will depend on speed. Here needle means a light ray and lotus is earth in astronomy [27]. It has 1000 dala (=petal, parts) like the highest lotus in human body or of *sudarśana* (zodiac). Circumference will be 3000 *yojana* pierced in a *nimeṣa* (=3000 truṭi). Thus, creation of *Brahma* on earth is within a twinkle or nimeṣa of Viṣṇu (sun).

Thus light travels 1/1000 of diameter 12, 756.274 kms in 1/33, 750 sec. (sidereal time). Velocity of light is 2,99,792.456 kms/sec., then 1 *yojana* = 8.907 kms.

To match with the velocity of light, diameter should be 1432 *yojana*, between two astronomical units.

7. Sun and solar system – Explanation of Sūryasiddhānta in the middle and recent ages after the collapse of education under foreign attacks is based on the assumption that yojana units for earth and stellar measure are the same. However, 3 types of stellar yojanas appear to have been used, In the present astronomy also, we use 3 units – light year (distance travelled by light in 1 year), A.U. = astronomical unit (semi major axis of earth's orbit) and persec (distance at which A.U. will have a parallax of 1 second)[28]. In vedas 1 *mahā yojana* = 5 *yojanas* of *Āryabhaṭa* or 8 of *siddhānta*. Distance of moon = *mahatāba* (name of moon) = 5863 *mahāyojana* (in Kaṭapayādi code) = 2,34,520 miles.

Triśaṅku (crux star) = 3 x 10^{13} *mahāyojana* = 204 light years

Agastya (canopus) = *Jaladhi* or 10^{14} *mahāyojana* = 680 light years

In *Sūrya-siddhānta*, as we have compared earth yojanas with dimensions of earth, we should compare sun *yojanas* also with dimensions of sun. This could not be done in past 2000 years due to the destruction of observatories.

Diameter of sun = 6500 *yojanas* (*Sūryasiddhānta* 4/1) = 13,92,000 km. (Astronomical Ephemeris) So 1 *yojanā* (stellar) – 13,920/65 = 214.15km. = 27 x 7.93 km. = 27 earth yojanas.

In *Sūrya siddhānta, bhū* = earth or 1. *Bha* = stellar or 27
Thus 1 bha *yojana* = 27 *bhūyojana.*

Third yojana is for making a map of 7 lokas in *Purāṇa,* each sphere is a yojana diameter and next sphere is 1 crore yojanas in this unit. Then the universe is of 7 spans.[22]

Siddhāntadarpaṇa (19/109) tells us that the heat of earth's energy spreads to 200 times diameter, brightness is 50 times this distance and visibility is further 25 times. Sun is 100 times bright, so its distance of heat, brightness will be 10 times this ratio. These three types of spheres of influence have been called 3 sāma in vedas[29]. Radius of these spheres have been measured by 'ahargaṇa' (= count of day or lighted regions). It appears that each spherical shell of influence has been divided in 6 ahargaṇas. Sphere of earth is 6 ahargaṇa diameter or 3 radius. Its first influence is agni upto 9 ahargaṇa, vāyu is upto 15 ahargaṇa and āditya is upto 21 ahargaṇa. The surfaces are divided into 8 vasu, 11 rudra and 12 āditya. Sphere upto 21st ahargaṇa is rathantara sāma, it reaches upto sun, so the outer region is called āditya. Sāmas of earth, sun are-

Stoma or Sun	Earth		Sun	
of ahargaṇa	Sāma	Manotā	Sāma	Manotā
21	Rathantara	Vāk	Bṛhat	Jyoti
33	Vairūpa	Gau	Vairāja	Gau
48	Śākvara	Dyau	Raivata	Āyu

Thus sun is beyond 10,000 diameters of earth (about 12,000 km). Similarly, Bṛhat sāma of sun is upto 2000 times its diameter. Earth is 109 times, Saturn about 1000 times and Plato 2000 times. (Next is sphere of Brightness Vairāja sāma with gau (light rays). This is upto 1 lakh times diameter of sun and may be defined as solar system size. Thus solar system is 1 crore times earth's diameter.

8. Dimensions of the Galaxy – Raivata sāma of sun extends to the whole of galaxy (brahmāṇḍa or parameṣṭhi maṇḍala). Its Manotā is āyu (life). Sūrya-siddhānta 12/90 tells that circumference of brahmāṇḍa is 1.87×10^{16} bha-yojana

(diameter comes to 1 lakh light years) which is the limit of visibility of sun's rays[30]. Verse 81 also tells that ākāśa orbit is limit of sunrays and this distance will be covered in 1 kalpa (432 crore years) at the speed of sun. Kalpa is a day of Brahma i.e. life of creation, so *Manotā* of this sphere has been called *Āyu* (life). *Revati* is last of the asterisms and completes the circle so its lord *pūṣā* has been called *viśvavedā (svasti pāṭha)*. Thus last sāma is *raivata sāma.* This estimate of 1 lakh light years diameter is in modern astronomy also and is 1 crore times the diameter of the solar system.

9. Seven Lokas and theUniverse – Almost all purāṇas have explained the sequence and structure of lokas. According to Viṣṇupurāṇa[31] the seven lokas are –

Bhū	Bhuvar	Svar	Mahar	Jana	Tapa	Satya
1	2	3	4	5	6	7
		Kṛtaka			Akṛtaka	

Sun and moon both are separately stated to be 1 lakh yojanas from earth. Distance of moon is only 50 thousand yojanas, so size of moon's orbit is about 1 lakh *yojanā* which is diameter of *Candramaṇḍala.* Distance of the solar system is 1 lakh times its diameter, its boundary is also called *bhūmi* which is bhūloka for next *triloki.* So *bhū* from sun is 1 lakh *yojana.* From here boundary of *maharloka* starts which when measured from earth (*dhruva* is its axis), it is 100 lakh *yojanas* where yojana is earth's diameter. Similarly *Janah* loka (galaxy) is 100 lakh *yojanas* in terms of solar system as 1 *yojana.* Thus its diameter is 200 lakh *yojanas. Tapoloka* is 4 times and *Satya loka* is 6 times. These are only for preparing schematic diagram on a plain paper because no two sphere with size ratio of 1 crore can be shown in the same map.

As the first and last three *lokas* are grouped together, 3 middle lokas also are grouped in a *triloki.* Thus there are 3x3 lokas with two in the middle as common. From various descriptions in *purāṇas, veda* and calculations here, the scheme is

1.2m	1.2×10^7m		10^{14}m		10^{21}m	10^{27}	10^{28}
Man	Earth		Solar system		galaxy	universe	satya
Loka	Bhū	Bhuvar	Svar	Mahar	Janah	Tapah	Satya
	Trilokī	Rodasī		Krandasī		Sanyatī	
	Ocean	Arṇava		Sarasvān		Nabhasvān	

As each sphere is 1 crore times the previous, *satya loka (svāyambhuva maṇḍala)* should be 10^7 x galaxy = 10^{28}m. It is derived from saying of *upaniṣad that ātmā is aṇu times aṇu and mahān* x *mahān* [32] *Maharloka* is 10^{14} times man, so *satya loka* should be $10^{14} \times 10^{14} = 10^{28}$m. Visible universe is *bhūmi,* like boundary of solar system, *Puruṣa* is 10 times more than that [(20)]. So visible universe is 10^{27} meters only. Accordingly to modern estimates, its diameter is 0.4×10^{27} meters with 3 times variation.[(28)]

10. Trilokī and rasa – a sphere enclosed by another sphere forms a *Trilokī-Bhū* is inner sphere, *bhuvar* is intervening space and *svar* is outer sphere. Four spheres with 3 intervening spaces are 7 lokas greater than man or higher lokas. If we count all 7 spheres from atom, there are 7+6 intermediate = 13 lokas. Thus *viśva* means 13 in astronomy [33]. Thus world is described fully by 3 *lokas* (interacting adjacent zones) or 7 spheres, this is the first verse of *atharvaveda/ Ṛgveda* describing forms of world having 21 branches.[34]

Vedas are divided into subjects related to 3 *guṇas – sattva* (source of energy), *raja* (dynamics, or transformational), *tama* (inert, passive receiver).[35]

For example, in the solar system, sun is the source of energy at the centre- it is *savitā* (producer). It is *kṛṣṇa* because its *ākarṣaṇa* (attraction holds together the moving *(raja)* planets.[36] *'Go'* means moving like the English word 'go'. It means rays of light as well as planets. So earth has also been called as cow (Gaiya in Greek). Earth is also *'gopī'* in the sense that it drinks *go* (rays of sun). All planets are *'gopīs'* moving in *vraja* (=to move) or viraja (without dust friction) region. Earth is base *(ādhāra)* called *rādhā.* All spheres from atom to *svayambhū maṇḍala* have *kṛṣṇa* at centre and *gopīs* moving around it in *vraja (bhuvarloka).* This is the *rasa* which has started the creation *(Brahmavaivartta Purāṇa, prakṛti khaṇḍ* chapter 2).

Highest *rasa* is of *svāyambhuva maṇḍla,* it is original brahma which is *rasa* i.e. uniform in all respects. All points can be considered centre of this rasa, this god is all pervading.[37] This can beexpressed in 3 ways *(tri satya)* so it is called *satya loka.* In *jyotiṣa,* the 3 ways of consideration are *dig, deśa, kāla (deśa, kāla, pātra* of literature). Three satya means same in all directions *(dig),* in all places *(deśa)* and at all times *(kāla).* These are called isotropic, homogeneous and steady state – the perfect cosmological principle being the foundation of modern cosmology[28].

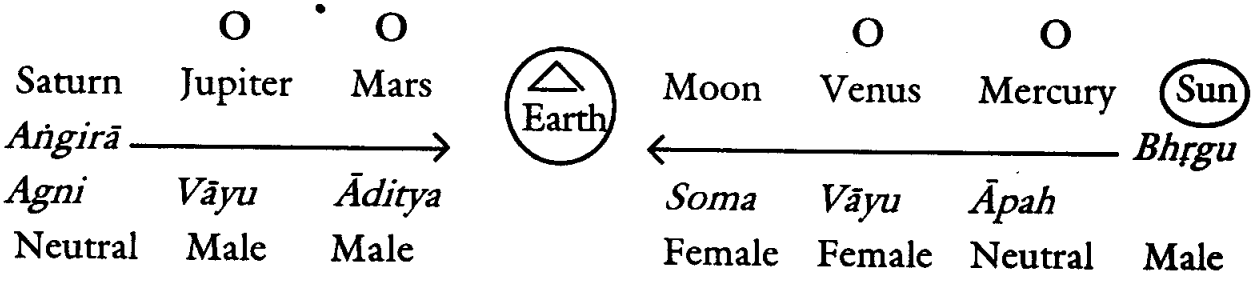
The dynamic *rasa* creating stars and planets is in *parameṣṭhī maṇḍala* or main *Brahmāṇda.* This is the region of *'go'* (starlight) so it is called *goloka* (galaxy). This is the country within which sun is visible so it is *parama-pada* (limit of steps) of *viṣṇu* (sun)[38]. Centre of *mahāviṣnu is mūla-barhaṇī nakṣatra* (the *mūla* or root from which expansion has occurred). This star in *dhanu rāśi* is really the center of the galaxy. Sun is at 30,000 light years from that, so *Brahma, viṣṇu* moved for 30,000 years in *līnga* of *Śiva* (*Lingapurāṇa,* chapter 17, *Śivapurāna rūdrasamhitā* chapters 7, 8)

In *'tapah* loka, rotation of galaxy is *'mana';*[39] one rotation period of galaxy is 1 *manvantara*(=71 yuga or about 30 crore years). Modern astronomy estimates[28] rotation period of sun round galaxy center to be 20 crore years. Rotation period of galaxy should be the same as *manvantara.*

In the visible universe, galaxy is a *'mana',* number of galaxies is 10^{11} *(Kharva),* particles as stars in galaxy are 10^{11}, it is equivalent to the human mind called *'mana'* which has also 10^{11} neurons.

Internal rāsa of galaxy *(goloka)* is rotation of stars around the galactic center. It causes mixing of two currents in galactic sea *(sarasvān).* Its water is called *'ambha' = salila* with sound. Vibration is *'ambhṛnīvāk'. Central field of galaxy is Bhṛgu* which extends in three stages upto sun – *Ap, vāyu, soma;* outside the tranquil sea solidifies as blocks of *'agni'* called *'angirā'* which has 3 stages from outside till sun – *agni, vāyu, āditya.* In the solar system, this is defined as to be within 1000 diameters of sun *(sāhasrī)* which extends upto the orbit of Saturn

1000 Diameters of sun



Source of heat at high temperature is *vṛṣā* (male) and receiver of energy is *yoṣā* (female). Classification of male, female neutral planets is in astrology texts.

There are 4 types of rasa seen on earth (see Essence of *Gītā* note 29) – (1) daly *rāsa* due to axial rotation of earth (2) Monthly *rasa* due to synodic revolution of moon (3) *samvatsara rāsa* or cycle of seasons (4) *Ayana rasa* or precession of earth's axis causing shifting of seasons in sidereal year in a cycle of 25000 years. In *devayuga, Taittirīya Brāhmaṇa* says that[40] vernal equinox was taking place in *kṛttikā nakṣatra.* So *ayana rasa* had two parts – bright half was from *kṛttikā* to *viśākhā* (or *rādhā)* equivalent to *pūrṇimā,* and dark half from *anurādhā* to *Bharaṇi.* Correspondingly, moon's *rasa* takes place on *kārtika pūrṇimā* [41] when moon is in *kṛttikā* and its light (sun) is in *rādhā (viśākhā).*

11.Conclusion – Seven *lokas* and 3 guṇas are the basis of divisions by 7 and 3 everywhere. Another view[42] is that *loka* themselves are due to 7 tongues of fire, their expansion – contraction cycle makes 14 tongues of *agni.* 7 lokas are reflected in 7 sheaths of human body. In geography, hemisphere of India has been divided from north pole to equator into 7 lokas and opposite hemisphere in 7 talas. Water/earth divisions are described by 7 *dvīpa* separated by 7 oceans. A combination of 3+7 has given rise to 3 space and 7 other dimensions. Discussion of 10 dimensional space of Vedas is subject of separate study. Modern cosmology has not thought about these features.

5 lord of 5 spheres and their elements are

Svayambhū	*Brahma*	*Ākāśa*
Parameṣṭhī	*Viṣṇu*	*Vāyu (vāk)*

Saura	*Indra*	*Teja*
Candra	*Soma*	*Ap*
Bhū	*Agni*	*Earth*

Chandramaṇḍala is the sphere around earth containing the moon's orbit. *Satyaloka* is beyond the visible universe, its uniform material is called *nārā* and its lord is *satya-nārāyaṇa*[43]. This is *the parātpara puruṣa* of veda who is beyond imagination. Its visible part is 1/10th called tapah loka whose lord brahmā extends till the boundary of *Parameṣṭhī maṇḍala. Parameṣṭhī* is outer limit of Viṣṇu or mahāviṣṇu [36]. Sun is Indra *(Indra* = burning fuel) i.e. source of energy. Since burning of energy will exhaust it, sun is *kṣara (martya)* model of all gods. Higher forms are *akṣara,* sun being at the boundary[44]. *Viṣṇu* is the force which holds together or collects from outside, opposite to *Indra* which spreads out its energy. *Viṣṇu loka* is *nāka* around which earth's axis *(śiva liṅga as per Śiva purāna, Vaidyeśvara Samhitā)* rotates. Its is axis round which all planets rotate, so it is *vaikuṇṭha* (the great axis pillar) – so wooden pillar is symbol for *viṣṇu in yajna. 'Indra'* effect at closer range is very hard and its heat breaks, so the effect is called *rudra* and region within the solar system is *rodasī triloki.* Beyond it, only light without heat is recognized, it is *śiva. rudra* has 3 stages – 100 diameters of sun *(śatardrī)* is upto earth orbit. This has eight physical forms at earth called 8 *vasu,* so 8 chapters of *yajurveda* describe R*udra. Sāhasri* is upto Saturn's orbit, *lakśa rudra* is at limit of the solar system, *koṭi rudra* is *sāmba-sadāśiva* as it is *śiva* with *ambhas* of *parameṣṭhi.* Whole world is *maheśvara,* at any point it is uniform light. Source of light or centers of *maṇḍalas* are *Vṛṣā* (male, father), dark regions or objects are *yoṣā* (female, mother). So 3 *maṇḍalas-solar,* galaxy, universe have 3 fathers *(ambaka),* 3 mothers *(ambikā),* Thus *śiva* is Triambaka. *Śiva* effect starts at the moon region, so the moon is on his head (=source).

FOOT NOTES

(1) ब्रह्मा देवानां प्रथमं सम्बभूव विश्वस्य कर्ता भुवनस्य गोप्ता ।

स ब्रह्मविद्यां सर्वविद्याप्रतिष्ठामथर्वाय ज्येठपुत्राय प्राह ॥ १ ॥

तत्रापरा ऋग्वेदो यजुर्वेदः सामवेदोऽथर्ववेदः शिक्षा कल्पो व्याकरणं निरुक्तं छन्दो ज्योतिषमिति.....।५। (मुण्डकोपनिषद् , प्रथममुण्डक, खण्ड १)

Brahmā became the first among devas as creater of world order and protector of people (This is the human Brahma born in human race of devas). He taught *Brahmavidyā* the foundation of all knowledge to his eldest son *Atharvā.*

(Thereafter) *aparā vidyā* (wordly, described in words) was divided into (4 vedas) *Ṛk, yajur, sāma, atharva,* and (6 limbs) *śikṣā, kalpa, vyākaraṇa, nirukta, chanda, jyotiṣa.*

- This was in 13,000 B.C. when *Abhijit* (vega, 28th star beyond the 27 star of equal division) Ruled by *Brahmā* was the pole star.

(2) यो त्रिषप्ताः परियन्ति विश्वाः ..... (अथर्ववेद १/१/१)

The Three sevens that surrounds the worlds.

(3) Oxford university had set up the Boden chair in 1831 for vedic propaganda. It has published 2 books by Sri S. Radhakrishnan – Principal Upaniṣads in translating *Muṇḍaka upaniṣad* tells that *Atharva* Veda was the first. The other books on Indian Philosophy tells that it was the last.

(4) M. Winternitz writes in A History of Indian literature, vol 1 Calcutta 1927 (text for all Indian Universities) pages 121-122.

With reference to this kind of prayer, Leopold von Schroder says – We may doubt whether these are productions of intelligent people. These are characteristics of writings of persons in the stage of imbecility. Examples of notes written by insane persons show a striking similarity with the prayers of the Yajurveda.

(5) अविद्यायामन्तरे वर्तमानाः स्वयं धीराः पण्डितं मन्यमानाः ।

जङ्घन्यमानाः परियन्ति मूढा अन्धेनैव नीयमाना यथान्धाः ॥ (मुण्डक १/२/८)

In *Kaṭhopaniṣad* (1/2/5) जङ्घन्यमानाः has been replaced by दन्द्रम्यमाणाः (Beating drums). *Mūḍha* (arrogant fools-bent on destroying Vedas) move in circles

i.e. quote each other. They are in *avidyā* i.e. prop. Up a limited closed view but pose like *dhīra* (one branch based on other ranches of knowledge) and *Paṇḍita* (seeing unity of knowledge). These blind are leading the Indian blind who are ignorant of the purpose and science both.

(6) इतिहासपुराणाभ्यां वेदं समुपबृंहयेत्

बिभेत्यल्पश्रुताद् वेदो मामयं प्रहरिष्यति । (महाभारत १/१/२६७, पद्मपुराण १/२/४१)

Vedas should be grasped with the help of *itihāsa* and *purāṇa.* Vedas are afraid of destruction from people who ignore this (and preach about Vedas)

(7) एतदेकैकस्य ग्रन्थ लक्षया न मस्करि पुरण मुद्गल प्रभृति आचार्यैर्निबिद्धं कृतं स कथं अनेनाचार्येण अल्पेन ग्रन्थेन शक्यते । गणितविदो मस्करीपूरणपूतनादयः सर्वेषाम् क्षेत्राणां फलं आयत चतुरस्र क्षेत्रे प्रत्याययन्ति ।

Bhāskara 1's commentary of *Ārayabhaṭiya* after verse 1/1 (page 7) and verse 2/9 (page 67) (This has not been composed as a treatise by the *ācāryas* like *Maskarī, Pūrāṇa* and *Mudgala* with one lakh verses for each (topic). How can this *ācārya* manage it within a short treatise!) (Mathematicians like *Maskarī, pūrāṇa* and *Pūtana* show the rationale of the areas of all figures in rectangular figures)

Maskarī means a man with a rod (hermit). In Arabic it means exercise. 'Khor' in Arabic means to blame and separate (with a rod). Mathematical processing is like that, so a book on mathematical methods was called 'Al-khwarizmi'. This became algorithm and logarithm in Latin, English. 'Long' also means rod. *Pūtana* word has been used for the process to find intermediate values. *'Mudgala'* means separate particles, *pūraṇa* is filling or explaining logically.

(8) *Majjhima Nikāya* (1/3/10) mentions six schools of thought uprooted by Buddha. This includes *pūrāṇa kaśyapa Makkhali (Maskarī) Gośāla.* Two followers of *Sanjay Velaṭṭhiputa* were *Sāriputta* and *Mandgalyāyana* who broke away and joined the Buddha.

(9) वालाग्रशतभागस्य शतधा कल्पितस्य च ।

भागो जीवः स विज्ञेयः स चानन्त्याय कल्पते ॥ (Śvetāśvatara upaniṣad 5/9)

"Assume hundred parts of one hundredth of a hair-end. This part is known as jīva which is not destroyed *(ananta)* in any creation (=chemical transformation)". This is the same as the concept of atom in chemistry.

(10) *Varāhamihira* was an astronomer of *Vikramāditya* whose *samvat* (era) started in 57 B.C. According to his text *Kutūhalamanjarī*, he was born on *Caitra* bright half 8th day in *Yudhiṣṭhira śaka* 3042 (i.e. 3006 *Kalisamvat* or 6.3.95 B.C.). As per *Bṛhatsamhitā* 13/3, the *śaka* started in 2526th year of *Yudhiṣṭhira śaka* i.e.612 B.C. Current historians, including astronomers wrongly think that *Śālivāhana śaka* (starting in 78 A.D.) is only *śaka*. None of the three *śaka* mentioned here are related to *śaka* kings nor any *Kuṣāna* king like *Kaniṣka* who started an era in his name – but these errors are considered established facts. *Varāhamihira* died in about 15 B.C., he could not have used Śālivāhana śaka starting in 78 A.D., nor he could have mentioned his death year as 509 in that era.

Bṛhatsamhita 56/2 tells

परमाणु रजोवालाग्रलिक्षायूकं यवोऽङ्गुलं चेति अष्टगुणानि यथोत्तरन् अङ्गुलमेकं भवति संख्या

Previous verse explains meaning of *paramāṇu* –

जालान्तरगते भानौ यदणुतरं दर्शनं रजो याति तद्विद्यात् परमाणु प्रथमं तद्धि प्रमाणानाम् ।

(11) Jaina and Bauddha units are described in Jaina Astronomy by S.S. Lishk chapter 2. Dimensions of atom and nucleus can be found in any physics text eg. By Resnik Haliday.

(12) अनाद्यनन्त कलिलस्य मध्ये विश्वस्य स्रष्टारमनेकरूपम् ।

विश्वस्यैकं परिवेष्टितारं ज्ञात्वा देवं मुच्यते सर्वपाशैः ॥

Viśva has many forms or sizes. *Viśva* means it is *'pariveṣṭita'* i.e. closed or covered from all sides. *(Śvetāśvatara upaniṣad* 5/13)

(13) विंशतिः कृमिजातय इति यूकाः पिपीलिकाश्चेति द्विविधा बहिर्मलजाः केशादाः लोमादाः लोमद्वीपाः सौरसा औदुम्बरा जन्तु मातरश्चेति षट् शोणितजा..... *(Carakasaṃhitā sūtrasthāna 19/8)*

Kṛmis are of 20 types – 2 from outside waste – *yūka, pipīlikā* 6 from blood – *Keśāda, lomāda, lomadvīpa, saurasa, audumbara, jantumātā.*

(14) वालाग्रमात्रं हृदयस्य मध्ये विश्वं देवं जातरूपं वरेण्यम् । अथर्वशिर उपनिषत् (५)

Living form (जातरूपं) of lord of world is within the heart which is of the size of a hair end.

(15) तत्र प्रथमे मासि कललं जायते (सुश्रुत शारीरस्थान ३/९)

स सर्वगुणवान् गर्भत्व मापन्तः प्रथमे मासि सम्मूर्छितः

सर्व धातु कलनीकृत.....अव्यक्त विग्रहः ..... (चरक शारीर ४/९)

i.e. Human egg after fertilization collects all materials *(dhātu)* so it is called *'Kalala'*. It is invisible without shape.

(16) पुरुषोऽयं लोके सम्मित इत्युवाच भगवान्पुनर्वसुरात्रेयः

यावन्तो हि लोके मूर्त्तिमन्तो भावविशेषास्तावन्तो पुरुषे, यावन्तः पुरुषे तावन्तो लोके । (चरक शारीर स्थान ५/२)

Bhagawān Punarvasu Ātreya told that *puruṣa* (man) is this whole world. Whatever forms and actions exist in world exists in man and vice versa.

(17) पुरुष एवेदं सर्वं यद् भूतं यच्च भव्यम् ।

उतामृतत्वस्येशानः यदन्नेनातिरोहति ॥ २ ॥ —पुरुषसूक्त—ऋग्वेद अष्टक ८/४/१७ या मण्डल १०/७/९० माध्यन्दिन यजुर्वेद अध्याय ३१, अथर्ववेद १९/६ शतपथ ब्राह्मण १३/६/२/१२, सामवेद आरण्यक काण्ड ६/४/२/३—६

puruṣa is everything including past and present.

(18) दश च वै सहस्राण्याष्टौ च शतानि सम्वत्सरस्य मुहूर्ताः । यावन्तो मुहूर्तास्तावन्ति पञ्चदशकृत्वः क्षिप्राणि । यावन्ति क्षिप्राणि तावन्ति पञ्चदशकृत्व एतर्हीणि । यावन्त्येतर्हीणि तावन्ति पञ्चदशकृत्व इदानीनि । यावन्तीदानीनि तावन्तः पञ्चदशकृत्वः प्राणाः । यावन्तः प्राणास्तावन्तोऽक्तनाः । यावन्तोऽक्तनास्तावन्तो निमेषाः । यावन्तो निमेषास्तावन्तो लोमगर्त्ताः । यावन्तो लोमगर्तास्तावन्ति स्वेदायनानि । यावन्ति स्वेदायनानि तावन्त एते स्तोका वर्षन्ति ॥ ५ ॥

एतद्धस्म वै तद्विद्वानाह वार्कलिः । सार्वभौमं मेघं वर्षन्तं वेदाहम् । अस्य वर्षस्य स्तोकानिति ॥ ६ ॥ (शतपथ ब्राह्मण १२/३/२/५—६१)

There are 10800 *muhūtra* in a *samvatsara,* 15 times *muhūtra* are *kśipra,* 15 times *kśipra* are *etarhi,* 15 times *etarhi* are *idāni,* 15 times *idāni* are *prāṇa. (Sāyaṇa* stops the division here itself and calls the next units as equal. Sri Motilal Sharma continues division till *svedāyana).* Division by 15 continues till units of *'aktana'* (or *ana), nimeṣa, lomagartta* and *svedāyana.* Rain drops *(stoka)* fall equal to number of *svedāyana* (in a year) (5)

This is the opinion of scholar Vārkali. (As per Sāyaṇa). Number of raindrops within the land area visible to man is equal to *svedāyana.*

Another meaning is that the raindrop falls from a height (270 meters) which is the distance travelled by light in *svedāyana* time = 1.2 x 10-6 seconds.

(19) *Ṛk veda* 1-50 is

तरणिर्विश्व दर्शतो ज्योतिष्कृदसि सूर्य / विश्वमाभासि रोचनम् । ४ ।

Sāyana commentary (15th century AD) – तथा च स्मर्यते –

योजनानां सहस्रे द्वे द्वे शते द्वे च योजने ।

स भूमिं निमिषार्धेन क्रममाण नमोऽस्तु ते ॥

(20) *Puruṣa sūkta* –

सहस्रशीर्षा पुरुषः सहस्राक्षः सहस्रपात् ।

स भूमिं विश्वतो वृत्वा अत्यत्तिष्ठद्दशांगुलम् ॥ १ ॥

Pururṣa is of thousand (or infinite) heads, eyes and feet. He covers *bhūmi* world) from all sides and extends ten times, more.

(21) *Carakasamhitā, Śarīrasthāna* (7/15)

त्रिंशत्सहस्राणि नव च शतानि षट्पञ्चाशत्कानि सिरा धमनीनामणुश ; प्रविभज्यमानानां मुखाग्र परिमाणं, तावन्ति चैव केशश्मश्रुलोमानि ।

Tantrantara and *Aṣṭāṅga saṃgraha* tell this number as 30 lakhs (commentary on *Caraka* by *Jaideva Vidyalankara).*

(22) क्वाहं तमोमहदहं खचराग्निवार्भू

संवेष्टिताण्डघटसप्तवितस्तिकायः ।

क्वेदृग्विझा विदणिचाण्ड पराणु चर्य्या

वाताध्वरोम विवरस्य च ते महित्वम् ॥ *(Bhagavata purana* 10/14/11)

(Brahma tells to *Kṛṣṇa)* what am I before you – a body of 7 spans (lokas) covered with tama (dark, root nature), *mahad* (gross collection), *aham,* sky, air, fire, water, earth. You are so great that your each hair contains 1 crore (or uncountable) *Brahmāṇḍa.*

(23) *Līlāvati* 1/5-6 of *Bhaskara* II,

यवोदरैरङ्गुलमष्टसंख्यैर्हस्तोऽङ्गुलैः षड् गुणितैश्चतुर्भिः ।

हस्तैश्चतुर्भिर्भवतीह दण्डः क्रोशः सहस्रद्वितयेन तेषाम् ॥ ५ ॥

स्याद्योजनं क्रोशचतुष्टयेन तथा कराणां दशकेन वंशः ।

8 *yava* width = 1 *angula,* 24 *angula* = 1 hand 4 hands = 1 *danda,* 2000 *danda*= 1 *Krośa (kosa)* 4 *Krośa* = 1 *yojanā*

(24) *Viṣṇupurāṇa* 2/8/20, 26 –

सर्वेषां द्वीपवर्षाणां मेरुरुत्तरतो यतः ॥ २० ॥

Meru is north of dvipas. *Sūryasiddhānta* (1/62) tells that prime meridian passes through *Meru, Laika, Ujjain.*

एवं पुष्कर मध्येन यदा याति दिवाकरः ।
त्रिंशदं भागन्तु मेदिन्यास्तदा मौहूर्तिकी गतिः ॥ २६ ॥

(25) *Vāteśvara Siddhānta, madhyamādhikāra,* verse 7,

कमलदलनतुल्यः काल उक्तस्त्रुटिस्तच्छतमिह लवसंज्ञस्तच्छतं स्यान्निमेषः

Truṭi is the time taken to pierce a lotus petal, 100 *truti* = Lava, 100 lava = *nimeṣa Siddhānta śiromani, madhyamādhikāra,* verse 16

योऽक्ष्णोर्निमेषस्य खरामभागः स तत्परस्तच्छत भाग उक्ता ।
त्रुटिर्निमेषैर्धृतिभिश्च काष्ठा तत् त्रिंशता सद्गणकैः कलोक्ता ॥ २६ ॥

1*nimeṣa* = 30 *tatpara,* 1 *tatpara* = 100 *timti,*
Siddhānta darpaṇa, also defines *truṭi* as time taken to pierce a lotus petal (1/24)

(26) *Viṣṇu purāṇa* (1/3/8-9), *Mahābhārata (śānti parva* 231/12, 13), *Harivamśa purāṇa, harivamsa parva* (8/3-5)

(27) *Padmapurāṇa, śṛṣṭi Khaṇḍa* (40/2-3)

तस्मिन्हिरण्मये पद्मे बहुयोजनविस्तृते । सर्वतेजोगुणमये पार्थिवैर्लक्षणैर्वृते ।
तच्च पद्मं पुराभूतं पृथिवी रूपमुत्तमम् । नारायणसमुद्भूतं प्रवदन्ति महर्षयः ॥ ३ ॥

In that shining lotus extending to many (=1000) *yojanā,* with all energy, properties and solid form, *Brahmā* was born. The great sages call that lotus emanating from *Nārāyaṇa* as earth.

त्वामग्ने पुष्करादध्यथर्वा निरमन्यत मूर्ध्नो विश्वस्य वाधतः
तमुत्वादध्यङ् ऋषिपुत्र ईधे अथर्वणः वृत्रहणं पुरन्दरम् ॥ (Ṛk veda 6/16/13-14)

(28) References on modren astronomy mentioned here and later on can be found in standard texts like " Introduction ot Cosmology" – J.V. Narlikar – Cambridge U.P. The structure of the Universe – J.V. Narlikar – OUP.

(29) Discussion of sama needs voluminous references – Madhusūdana Ojha and his student Motilal Sharma of Jaipur have explained them in many of their books, published mainly by Rajasthan Patrika, Kesargarh, Jaipur

302004. All books are rare now. Essence of *Bhagavadgīta* page 47 explains 4 *viṣṇus* on the basis of *ahargaṇa* of earth. (A.S. Ramanathan's English commentrary on this book of Śrī Ojha). The following books of Sri Motilal Sharma discuss this –

1. *Srāddha vijnāna* part 4.
2. *Upaniṣad vijnāna bhāṣya bhūmikā* part 2 (page 324)

Original source – *Aitareya Brāhmaṇa* (19/6/28), (17/7/13) *Taittirīya Brāhmaṇa* (1/4/6)

(30) Sūrya Siddhanta, chapter 12 –

कल्पोक्त चन्द्र भगणागुणिता शशिकक्षया ।
आकाश कक्षा सा ज्ञेया कर व्याप्तिस्तथा रवेः ॥ ८२ ॥
खव्योम खत्रय खसागर षट्क नाग व्योमाष्ट शून्ययमरूप नगाष्टचन्द्राः ।
ब्रह्माण्ड सम्पुट परिभ्रमणं समन्तादभ्यन्तरा दिनकरस्य करप्रसाराः ॥ ९० ॥

(31) *Viṣṇu Purāṇa* (2/7)

रविचन्द्रमसोर्यावन्मयूखैरवभास्यते
स समुद्र सरिच्छैला तावती पृथिवी स्मृता ॥ ३ ॥

One earth is formed of rocks, the other is till the light of sun shines (boundary of solar system)

यावत्प्रमाणा पृथिवी विस्तार परिमण्डलात् ।
नभस्तावत्प्रमाणं वै व्यासमण्डलतो द्विज ॥ ४ ॥
भूमेर्योजन लक्षे तु सौरं मैत्रेय मण्डलम् ।

(*Bhūmi* of solar *maitreya* or shining sphere is 1 lakh yojanas).

लक्षाद्दिवाकरस्यापि मण्डलं शशिनः स्थितम् ॥ ५ ॥
ध्रुवादूर्ध्वं महर्लोको यत्र ते कल्पवासिनः ।
एकयोजनकोटिस्तु यत्र ते कल्पवासिनः ॥ १२ ॥
द्वे कोटि तु जनो लोको यत्र ते ब्रह्मणः सुताः- ।
सनन्दनाद्याः प्रथिता मैत्रेयामलचेतसः ॥ १३ ॥
चतुर्गुणोत्तरे चोर्ध्वं जनलोकात्तपः स्थितम् ।
वैराजा यत्र ते देवाः स्थिता दाह विवर्जिताः ॥ १४ ॥
षड्गुणेन तपो लोकात्सत्यलोको विराजते ।
अपुनर्मारका यत्र ब्रह्मलोको हि स स्मृतः ॥ १५ ॥

भूमि सूर्यान्तरं यच्च सिद्धादि मुनि सेवितम् ।
भुवर्लोकस्तु सोऽप्युक्तो द्वितीयो मुनिसत्तम ॥ १७ ॥
ध्रुव सूर्यान्तरं यच्च नियुतानि चतुर्दश
स्वर्लोको सोऽपि गदितो लोकसंस्थानचिन्तकैः ॥ १८ ॥
त्रैलोक्यमेतत्कृतक मैत्रेय परिपठ्यते ।
जनस्तपस्तथा सत्यमिति चाकृतकं त्रयम् ॥ १९ ॥

Sun-moon-*nakṣatra-budha-śukra-maṅgala-Bṛhaspati-śani-saptarṣi-dhruva-* These are shown with 1 lakh yojanā gaps from *budha* to *Bṛhaspati.* Then *dhruva* is 14 lakh yojanā.

(32) *Kaṭhopaniṣad* (1/2/20), *Śvetāśvatara* (3/20)

अणोरणीयान् महतो महीयानात्मा गुहायां निहितोऽस्य जन्तोः ।

(33) Comentary of *Āryabhaṭiya by Bhāskara* I, appendix VII of INSA edition lists all word numerals used by *Bhāskara.*

(34) *Atharva veda* (1/1/1)

ये त्रिषप्ताः परियन्ति विश्वाः

Taittirīya Brāhmaṇa (3/12/9/1)

ऋग्भ्यो जातां सर्वशो मूर्त्तिमाहुः
सर्वागतिर्याजुषी हैव शश्वत् ।
सर्वं तेजं सामरूप्यं ह शश्वत्
सर्व हेदं ब्रह्मणा हैव सृष्टम् ॥

Ṛk = mūrti or form, *yajur* = motion, *Sāma* = teja or field of influence, *Atharva* – Sarva or Brahma. Branches of vedas as per *Caraṇa vyūha* or *muktikopaniṣad* – *Rk* = 21, *yajur* – *kṛṣṇa* 86+*śukla* 15 = 101 *Sāma* = 1000, *Atharva* = 9,

(35) *Gītā* (2/45) – त्रैगुण्यविषया वेदाः ।

(36) *Yajurveda, Vājasaneyī* (33/43)

आकृष्णेन रजसा वर्तमानो निवेशयन्नमृतं मर्त्यं च ।
हिरण्मयेन सविता रथेना देवो याति भुवनानि पश्यन् ॥

(37) *Taittirīya upaniṣad* (2/7/1)

असद्वै इदमग्र आसीत् । ततो सदजायत । तदात्मानं स्वयमकुरुत । ... यद्वै तत्सुकृतं रसो वै सः ।

Three satyas in *Bhāgavata purāṇa* (10/2/26)

सत्यव्रतं सत्यपरं त्रिसत्यं सत्यस्य योनिं निहितं च सत्ये ।

सत्यस्य सत्यं ऋत सत्यनेत्रं सत्यात्मकं त्वां शरमं प्रपन्नाः ॥

(38) *Ṛgveda* (1/22/17) gives 3 steps (3 directions of space) and 3 vikrama (sphere of influence) of *viṣṇu*

इदं विष्णुर्विचक्रमे त्रेधा निदधे पदम् ॥ १७ ॥

तद् विष्णोः परमं पदं सदा पश्यन्ति सूरयः ॥ २० ॥

20th *sūkta* gives *parama pada* as spread of star light –

(39) *Śatapatha Brāhmaṇa* (10/5/4/3)

तदिदमनः सृष्टमाविरबुभूषत् निरुक्ततरम् मूर्त्ततरम् । तदात्मानमन्वैच्छत् । तत्तपोऽतप्यत.... ते मनसैवाधीयन्त मनसा चीयन्त । ....

Manvantara is defined in all astronomy texts and *purāṇas, mahābhārata* e.g. *Sūryasiddhānta* (1/18), *Āryabhaṭīya* (1/5), *Viṣṇupurāṇa* (1/3/16-21, 6//9-12)

(40) *Taittirīya Brāhmaṇa* (3/1/1).

तन्नो देवासो अनुजानन्तु कामम् ...

दूरमस्मच्छत्रवो यन्तु भीताः

तदिन्द्राग्नी कृणुतां तद्विशाखे...

नक्षात्राणामधिपत्नी विशाखे

श्रेष्ठाविन्द्राग्नी भुवनस्य गोपौ ॥ ११ ॥

पूर्णा पश्चादुत पूर्णा पुरस्तात्

उन्मध्यतः पौर्णमासी जिगाय

तस्यां देवा अधिसंवसन्तः

उत्तमे नाम इह मादयन्ताम् ॥ १२ ॥

Deva fulfil desires, rise from *indrāgni* (kṛttikā) to *viśākha*. Then they become full and is called *paurnamāsi*. Then the movement reverses. This movement is around nāka (top point of ecliptic sphere).

(41) Moon is *Kṛṣṇa*– ब्रह्मा कृष्णश्च नो ऽवतु *(yajur vajasaneyi* 23/3) This is explained by चन्द्रमा वै ब्रह्मा कृष्णः (Śatapatha Brāhmaṇa 13/2/7/7). This form of *Kṛṣṇa* is called *Vaihāyasa* as moon moves like a bird in sky –

चन्द्रमा अप्स्वन्तरा सुपर्णो धावते दिवि *(Rg veda* 1/105/1)

Moon is *Kṛṣṇa* because it is dark and is lighted by sun rays –

अत्राह गोरमन्वत नाम त्वष्टुरपीच्यम् ।

इत्था चन्द्रमसो गृहे । (Ṛg veda 1/84/15)

Moon light is white Rādha – This is because sun light is stopped *(Rādha)* and reflected. *Indra* is *Vṛṣa* and soul of sun, its shine is Bhānu, being born from that *Rādhā* is *Vrsabhānujā.*

प्रथमं पूजिता राधा गोलोके रासमण्डले ।

पौर्णमास्यां कार्तिकस्य कृष्णेन परमात्मना । (*Devībhāgavata* 9/1/152)

(42) *Muṇḍaka upanisad* (1/2/4)

काली कराली च मनोजवा च, सुलोहिता या च सुधूम्रवर्णा ।

स्फुलिङ्गिनी विश्वरुची च देवी, लेलायमाना इति सप्त जिह्वाः ॥

Ṛg veda (1/89/7) – अग्नि जिह्वा मनवः

i.e. *Manus* are tongues of *agni* or agni tongues are 14 *(manu) Muṇḍaka upaniṣad* (2/1/8)

सप्त प्राणाः प्रभवन्तिः तस्मात् सप्तार्चिषः समिधः सप्त होमाः ।

सप्त इमे लोका येषु चरन्ति प्राणा गुहाशया निहिताः सप्त सप्त ॥

(43) *Manusmṛti* (1/10)

आपो नारा इति प्रोक्ता आपो वै नरसूनवः ।

ता यदस्यायनं पूर्वं तेन नारायणः स्मृतः ॥

(44) *Yajur Vājasaneyi* (33/43)

आकृष्णेन रजसा वर्तमानो निवेशयन्नमृतं मर्त्यं च ।

हिरण्मयेन सविता रथेना देवो याति भुवनानि पश्यन् ॥

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1. Ṛgveda, Sāma and Atharva veda with Sāyana Bhāṣya have been published by M/s Chowkhamba Vidyabhawana, Chowk, Post Box No. 1069, Vāranasi – 221001. Its branch is Chowkhamba Sanskrit Pratisthan, 38 U.A., Bungalow Road, Jawahar Nagar, Delhi – 11007
It has published Yajur veda, Vājasaneyī samhitā with Uvvaṭa, Mahīdhara commentaries in sanskrit with Hindi translation of text.
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7. Carakasamhitā, Suśrutasamhitā with Hindi and English commentaries are published by Chowkhamba and M/s Motilal Banarsidass, 41 U.A., Bungalow Road, Jawahar Nagar, Delhi – 110 007.
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10. Rajasthan Patrika Ltd, Keshar Garh, Jawahar lal Nehru Marg, Jaipur – 302 004 has published the following – Essence of Gītā by Sri Madhusudan Ojha in sanskrit with notes in English by A.S.Ramnathan. Bharatia Hindu Manava aur usaki bhavukata, Śraddhā vijnāna, upaniṣad vijnāna bhāṣya and Sanskritik vyākhyān Panchak of Sri Motilal Sharma.
11. Bihar Rashtra Bhasha Parishad, Āchārya Śivapūjan Sahaya Marg, Patna– 800 004 has published two books by Sri Giridhar Sharma Chaturvedi to explain writings of Sri Madusudan Ojha in Hindi – Vaidik Vijanana aur Bharatiya Sanskriti Purana Parishilan
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